REMARKS

Claims 1-17 are pending in the application. Claims 1-7, 12, 15, and 17 are rejected. Claims 1, 7-11, 13, 14, and 16 are objected to. Claims 1, 7, 14 and 16 are amended herein. The Drawings are objected to. The Specification is objected to. Claim 18 is newly presented. No new matter is added. All rejections and objections are respectfully traversed.

DRAWINGS

In paragraphs 1.1 – 1.8, the Examiner objects to the Drawings. Figures 1, 3a-3e, 6, 8, and 9 are amended in the proposed Drawing Amendment submitted herewith, with corrections in red ink, as well as substitute Figures 1, 3a-3e, 6, 8, and 9.

SPECIFICATION

In paragraphs 2.1 - 2.30, the Examiner objects to the Specification. The Specification is amended herein to overcome the Examiner's objections.

CLAIM OBJECTIONS

In paragraphs 3.1 – 3.6, the Examiner objects to claims 1, 7, 13, 14, and 16. Claims 1, 7, 14, and 16 are amended to overcome the Examiner's objections in paragraphs 3.1 – 3.4 and 3.6.

At paragraph 3.5, the Examiner indicates the specification is objected to, but goes on to recite objections to claims 13 and 14. The Applicants believe the Examiner intended the objections as claim objections. Further, in paragraph 3.5, the

Examiner asserts that the term "the transmission channel" recited in each of claims 13 and 14 lacks antecedent basis. Claim 13 depends from claim 12, which depends from claim 7. Claim 7 includes the limitation "a transmission channel," thus providing proper antecedent basis for "the transmission channel" recited in claim 13. Claim 14 is amended herein to depend from claim 7.

Claim Rejections

Claims 1-4, 7 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanner (U.S. 4,547,882 – "Tanner"), in view of Ruger (Efficient inference and learning in decimitable Boltzmann machines, February, 1997 – "Ruger").

The invention ***evaluates*** an error-correcting code for a data block of a finite size. An error-correcting code is defined by a parity check matrix and the parity check matrix is represented as a bipartite graph. A single node in the bipartite graph is iteratively renormalized until a predetermined threshold is reached. Thus, the error correcting code is evaluated according to its failure rate. The invention takes as input the output error-correcting codes, e.g., Tanner, and evaluates them. Tanner can never be used to make the invention obvious.

Tanner takes as input a block code for which he constructs and implements error-correcting codes, see, col. 3, lines 57-66. The output of Tanner is "a family of codewords, which can be corrected for induced transmission errors," see col. 4, lines 11-33. There, Tanner describes selecting a bipartite undirected graph, assigning digit positions for the codeword and subcode definitions for first nodes in the graph, and assigning values to second nodes such that subcode definitions of first nodes connected to the second nodes are satisfied. As stated above, Tanner

constructs error correcting codes for his decoder, see, col. 13, lines 5-23. Nowhere does Tanner suggest a method for evaluating his error-correcting codes.

The Examiner asserts that "by stating that his new codes are comparable or superior to prior art codes, Tanner is clearly evaluating his codes with the same criteria used to evaluate the best known codes." But, how is Tanner evaluating the error-correcting codes? Where are the steps for evaluating? The assertion by the Examiner is non-sequitor. MPEP 707.07(f) mandates that "where a major technical rejection is proper, it should be stated with a full development of the reasons rather than by a mere conclusion coupled with some stereotyped expression." The rejection by the Examiner is a mere conclusion. The Applicants request the Examiner to specifically point out, citing column and line, where Tanner describes a method that evaluates error-correcting codes as claimed.

Claimed is defining an error-correcting code by a parity check matrix and representing the parity check matrix as a bipartite graph. Tanner does the opposite. Tanner begins by selecting a bipartite graph, see, e.g., col. 7, lines 59-60, "*The construction is based on a connected bipartite undirected graph.*" He then generates a parity check matrix to define an error-correcting code for a block code, see col. 8, lines 35-46.

Further, the Examiner admits, and the Applicants agree, that Tanner does not teach the step of iteratively renormalizing a single node in the bipartite graph until a predetermined threshold is reached, as claimed.

Ruger describes a method for doing inference and learning in a Boltzmann machine. Ruger decimates nodes of an initial network of nodes to produce a trivial

network, see, Figure 3. First, it should be understood that Ruger cannot be combined with Tanner. The Boltzmann Machines described in Ruger can never be represented as a bipartite graph as in Tanner. By definition, a bipartite graph can be partitioned into two subsets of nodes such that each node is joined to every node in the other subset. A bipartite graph, also called a bigraph, is a set of graph vertices decomposed into two disjoint sets such that no two graph vertices within the same set are adjacent, see Mathworld bipartite graph definition, cited by the Examiner as to claims 5 and 6. Ruger describes one set of nodes grouped into four sub-sets, see, page 3, section 2, lines 1-12. Ruger can never be represented by a bipartite graph because two does not equal four.

Claimed is iteratively renormalizing a single node in the bipartite graph until a predetermined threshold is reached. The claimed iterative renormalization evaluates the performance of an error-correcting code. The invention never changes the error-correcting code that it evaluates. The invention transforms the *structure that represents the performance* of a decoder. At page 11 of the office action, it is apparent that the Examiner erroneously believes that the point of the invention is to "produce simpler codes through decimation without losing a large amount of the code's effectiveness," and to "simplify encoding and decoding process." However, the invention never changes or simplifies error correcting codes.

The invention only evaluates error correcting codes. Combining Ruger with Tanner would change (simplify) the error-correcting codes generated by Tanner. Again, the invention could then be used to evaluate the resulting simplified code, but the invention never changes error correcting codes.

Claim 2: Ruger decimates nodes in the actual code, while the invention only evaluates an existing error-correcting code. The invention operates only on the structure that represents performance of a decoder.

Claim 3: The decimation of Ruger would change the Tanner code. The invention never changes code. The invention analyses decoder performance. Further, decimation according to the Examiner's proposed method reducing edges, as per Ruger, would violate the rules of a bipartite graph, where nodes of one type must be connected only to nodes of the other. Further, Ruger and Tanner operate directly on codes. The invention operates on the representation of code performance. The two are unrelated.

Claim 7: Ruger can never teach any operation on the bipartite graph as the Boltzmann Machines described by Ruger cannot be represented by a bipartite graph. Ruger can never be used to make the invention obvious.

Claim 15: As stated above, Tanner never describes, teaches, suggests or shows any criteria at all for evaluation codes. Further, Tanner selects graphs to construct a particular code. The invention evaluates the performance of existing codes. Tanner selects before codes are constructed, the invention analyses constructed codes. Tanner can never make the invention obvious.

Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanner and Ruger, in further view of Mathworld (website definitions of loop and bipartite graph).

Tanner and Ruger cannot be combined, because, as stated above, Ruger's Boltzmann machines can never be represented by a bipartite graph. The Mathworld definition of loop free graphs and graph with loops not withstanding, Ruger and Tanner can never be combined.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanner and Ruger, in further view of MacKay (Relationships between sparse graph codes).

In claim 12, columns represent variable bits and rows define parity bits, an overbar is placed above columns representing hidden variable bits which are not transmitted, and the hidden variable bits are represented by hidden nodes in the bipartite graph. MacKay describes constructing error correcting codes. MacKay generalizes parity check matrices for constructing error correcting codes. Here again, the operation of the reference is applied to the code itself during construction, never to the representation of error correcting code performance. The invention analyses the actual performance of already constructed codes, while the references cited by the Examiner try to construct the best code. The output codes of the references can only be evaluated as claimed after the methods according to the references are complete.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanner and Ruger, in further view of Chung, et al, (Analysis of sum-product decoding of low-density parity check codes using a Gaussian approximation – "Chung").

Tanner constructs error-correcting codes. The invention evaluates error correcting code performance. Ruger decimates Boltzmann machine representations, which has absolutely nothing to do with what is claimed, an futher,

can never be represented as bipartite graphs. Chung fails to cure the defects of Tanner and Ruger. Chung describes simplifying the analysis of the performance of decoders where the transmission channel is an additive white Gaussian noise channel. However, Chung never describes defining an error-correcting code by a parity check matrix, representing the parity check matrix as a bipartite graph, and iteratively renormalizing a single node in the bipartite graph until a predetermined threshold is reached. The Examiner is requested to specifically point out where Chung describes the steps of defining, representing and iteratively renormalizing, which are not described in either of Tanner or Ruger.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanner and Ruger, in further view of Luby, et al., (U.S. 6,073,250 – "Luby").

At col. 20, lines 47-51, Luby describes determining an error rate for a decoder. Luby teaches plotting a probable error rate against a failure rate, i.e., actual failures of decoder convergence. However, Luby never describes, suggests or shows the claimed evaluating an error rate for the renormalized bipartite graph. Therefore, Luby, combined with Tanner and Ruger, can never make the invention obvious.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance and an early indication of the same is courteously solicited. The Examiner is respectfully requested to contact the undersigned by telephone at the below listed telephone number, in order to expedite resolution of any remaining issues and further to expedite passage of the application to issue, if any further comments, questions or suggestions arise in connection with the application.

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 50-0749 and please credit any excess fees to such deposit account.

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